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## Abstract

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**PI Title:**

**Project Title:** BIOPHYSICAL DETERMINANTS OF DIABETIC FOOT ULCER HEALING

**Abstract:** *DESCRIPTION (adapted from the application) The overall goal of this research project grant (R01) is to develop a comprehensive understanding of the biophysical factors determining diabetic foot ulcer healing. Approximately 16 million Americans are known to have diabetes. Foot ulcers and their sequelae are a major source of morbidity, cause for hospitalization, and pathway to lower extremity amputation for these patients. An understanding of the biophysical determinants to heal diabetic foot ulcers is needed to improve treatment and reduce the enormous associated morbidity and suffering. The purpose of this study is to evaluate the impact of extrinsic physical and intrinsic biological factors in healing of diabetic foot ulcers. Specifically, the following hypotheses will be tested: 1) Repetitive daily loading is a more sensitive determinant of the rate of ulcer healing than peak normal pressure with total contact cast treatment (TCC); 2) Diabetic patients with slower rates of ulcer healing will have a) less sympathetic nerve activity and b) less sympathetically-controlled blood flow than patients with faster rates of ulcer healing, c) decreased sympathetic nerve activity and sympathetically-controlled blood flow are associated with decreased local tissue oxygenation; and 3) In the absence of severe hyperglycemia or clinical infection, rates of ulcer closure will be slower for patients with impaired local tissue oxygenation. 80 subjects with diabetic foot ulcers will be treated with TCC's and followed until ulcer healing or for 13 weeks. Extrinsic physical factors assessed include spatially averaged peak pressures measured with an array of capacitive sensors and repetitive loading measured with a step counter. Intrinsic biological factors measured will include sympathetic nerve activity and sympathetically-controlled blood flow, as determined by microneurography and doppler techniques, local tissue oxygenation*

*(TCO<sub>2</sub>), glycemic control (HbA<sub>1c</sub>), and bacterial burden (quantitative bacteriology). Three-dimensional rate of ulcer healing will be measured with stereophotography and computerized image analysis techniques.*

***Thesaurus Terms:***

*biophysics, diabetes mellitus, foot, skin ulcer, wound healing  
bacterial disease, blood flow, blood glucose, human therapy evaluation, mechanical pressure, oxygen transport, sympathetic nervous system  
clinical research, human subject, stereophotography, ultrasound blood flow measurement*

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